

What is claimed is:

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1. A substrate processing method comprising:
- (a) providing a substrate in a process zone, the substrate comprising etch resistant material over an underlying material;
- and
- (b) removing the etch resistant material in the process zone;
- (c) after (b), providing an energized process gas in the process zone to etch the underlying material.
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2. A method according to claim 1 wherein (b) comprises providing an energized stripping gas in the process zone under process conditions selected to substantially remove a layer of etch resistant material.
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3. A method according to claim 2 wherein the energized stripping gas comprises an oxygen-containing gas.
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4. A method according to claim 3 wherein the energized stripping gas further comprises an oxygen activating gas.
5. A method according to claim 4 wherein the oxygen activating gas comprises a nitrogen-containing gas.
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6. A method according to claim 1 wherein the substrate comprises at least two layers of etch resistant material and (b) comprises removing at least one of the layers of etch resistant material.
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7. A method according to claim 6 wherein at least one of the layers comprises mask material.
8. A method according to claim 7 further comprising providing an energized process gas to etch apertures in the mask material.

9. A method according to claim 7 further comprising providing an energized process gas in the process zone to etch apertures in the mask material.

5 10. A method according to claim 7 further comprising, before (b), providing an energized process gas in the process zone to etch apertures in the mask material.

11. A method according to claim 1 wherein the layer comprises silicon and wherein the energized process gas comprises a halogen-containing gas.

12. A method according to claim 11 wherein the energized process gas comprises one or more of CF_4 , C_2F_6 , NF_3 , SF_6 , Cl_2 , Br_2 , HBR , and HCl .

13. A method according to claim 1 wherein the process zone is an energized gas zone in a process chamber.

14. A substrate processing method comprising:
(a) providing a substrate in a process zone, the substrate comprising a first and a second etch resistant material;
(b) providing an energized process gas in the process zone to form apertures in the first etch resistant material; and
(c) removing the second etch resistant material in the process zone.

25 15. A method according to claim 14 wherein the first etch resistant material comprises mask material.

16. A method according to claim 14 wherein the second etch resistant material comprises photoresist.

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17. A method according to claim 14 wherein (b) comprises forming apertures in the first etch resistant material in accordance with a pattern of the second etch resistant material.

18. A method according to claim 14 wherein (c) comprises providing an energized stripping gas in the process zone under process conditions selected to substantially remove the second etch resistant material.

5 19. A method according to claim 18 wherein the energized stripping gas comprises an oxygen-containing gas.

10 20. A method according to claim 14 wherein the substrate comprises a layer under the first and second etch resistant materials and further comprising providing an energized process gas to etch the layer.

21. A method according to claim 14 wherein the substrate comprises a layer under the first and second etch resistant materials and further comprising providing an energized process gas in the process zone to etch the layer.

22. A method according to claim 14 wherein the substrate comprises a layer under the first and second etch resistant materials and further comprising, after (c), providing an energized process gas in the process zone to etch the layer.

23. A method according to claim 22 wherein the layer comprises silicon and wherein the energized process gas comprises a halogen-containing gas.

24. A method according to claim 23 wherein the energized process gas comprises one or more of CF_4 , C_2F_6 , NF_3 , SF_6 , Cl_2 , Br_2 , HBR , and HCl .

25 25. A method according to claim 14 wherein the process zone is an energized gas zone in a process chamber.

30 26. A substrate processing method comprising:
(a) providing a substrate in a process zone, the substrate comprising etch resistant material; and
(b) removing the etch resistant material while detecting radiation emanating from the process zone.

27. A method according to claim 26 further comprising detecting a condition of the radiation related to removal of the etch resistant material.

5 28. A method according to claim 26 comprising detecting radiation emitted from an energized gas in the process zone.

29. A method according to claim 26 wherein the etch resistant material comprises photoresist and comprising removing the photoresist while detecting a condition of the radiation related to the removal of photoresist.

30. A method according to claim 26 comprising directing radiation onto the substrate and monitoring the radiation reflected by the substrate.

31. A method according to claim 26 comprising providing an energized stripping gas in the process zone under process conditions selected to substantially remove a layer of etch resistant material.

32. A method according to claim 31 further comprising changing process conditions when a characteristic feature of the radiation is detected.

33. A method according to claim 32 wherein the characteristic feature is related to an endpoint of removal of the etch resistant material.

25 34. A substrate processing method comprising:
(a) providing a substrate in a process chamber;
(b) providing an energized process gas in the chamber to process the substrate, thereby depositing process residue on surfaces of the process chamber;
(c) providing an energized process gas in the chamber to
30 simultaneously remove a material from the substrate and at least partially remove the process residue from the surfaces of the process chamber; and
(d) after (c), providing an energized process gas in the chamber to further process the substrate.

35. A method according to claim 34 wherein (b) comprises providing an energized process gas in the chamber to form apertures in a material on the substrate.

5 36. A method according to claim 35 wherein (b) comprises forming apertures in a material comprising mask material.

37. A method according to claim 34 wherein (c) comprises removing etch resistant material from the substrate.

10 38. A method according to claim 34 wherein (d) comprises etching a material on the substrate.

39. A substrate processing method comprising:
(a) providing a first substrate in a process chamber;
(b) providing an energized process gas to etch the first substrate, thereby depositing first residue on the surfaces of the process chamber;
(c) providing a second substrate in the process chamber; and
(d) providing an energized process gas to process the second substrate and simultaneously remove the first residue from the surfaces of the process chamber.

40. A method according to claim 39 wherein (d) comprises forming apertures in a material on the second substrate.

25 41. A method according to claim 40 wherein (d) comprises forming second residue on the surfaces of the process chamber.

30 42. A method according to claim 41 further comprising removing the second residue from the surfaces of the process chamber.

43. A method according to claim 41 further comprising removing a material from the second substrate and simultaneously removing the second residue from the surfaces of the process chamber.

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44. A substrate processing method comprising:

- (a) providing a first substrate in a process chamber;
- (b) providing an energized process gas to etch the first substrate, thereby depositing first residue on the surfaces of the process chamber;
- (c) providing a second substrate in the process chamber; and
- (d) providing an energized process gas to at least partially remove the first residue from the surfaces of the process chamber; and
- (e) after (d), removing the second substrate from the chamber.

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45. A method according to claim 44 wherein (d) comprises simultaneously processing the second substrate.

46. A method according to claim 44 wherein (d) comprises providing an energized process gas comprising a fluorine-containing gas.

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47. A method according to claim 46 wherein (d) comprises providing an energized gas comprising one or more of CF_4 , C_2F_6 , SF_6 , and NF_3 .

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48. A substrate processing method comprising:

- (a) providing a substrate in a process chamber;
- (b) providing a first energized process gas to etch a material on the substrate, thereby depositing residue on the surfaces of the process chamber;
- (c) providing a second energized process gas to remove substantially all of the residue deposited in (b) from the surfaces of the process chamber; and
- (d) after (c), removing the second substrate from the chamber.

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49. A method according to claim 48 wherein (c) comprises simultaneously processing the substrate.

50. A method according to claim 48 wherein (c) comprises removing a second material from the substrate.

51. A substrate processing method comprising:

- 5 (a) providing a substrate in a process zone, the substrate comprising resist material over mask material;
- (b) providing an energized process gas in the process zone to form apertures in the mask material;
- 10 (c) providing an energized process gas in the process zone to remove the resist material; and
- (d) providing an energized process gas in the process zone to etch a layer under the mask material.

52. A method according to claim 51 wherein (c) comprises providing an energized stripping gas in the process zone under process conditions selected to substantially remove a layer of resist material.

53. A method according to claim 52 wherein the energized stripping gas comprises an oxygen-containing gas.

54. A method according to claim 51 wherein the layer comprises silicon and wherein the energized process gas comprises a halogen-containing gas.